



INNOVATIVE (ECO-) TECHNOLOGY, ENTREPRENEURSHIP AND REGIONAL DEVELOPMENT

9th International Conference

INNOVATIVE (ECO-)TECHNOLOGY, ENTREPRENEURSHIP AND REGIONAL DEVELOPMENT (IECOTERD)

October 10, 2023

e-Book of Abstracts

KAUNO
KOLEGIJA



Higher Education Institution

Kaunas, 2024

Scientific Committee:

dr. Ina Bikuvienė, Kauno Kolegija Higher Education Institution (Lithuania);
dr. Renata Gudaitienė, Kauno Kolegija Higher Education Institution (Lithuania);
dr. Giedrius Gecevičius, Kauno Kolegija Higher Education Institution (Lithuania);
dr. Žydrūnas Kavaliauskas, Kauno Kolegija Higher Education Institution (Lithuania);
dr. Vilma Kazlauskienė, Kauno Kolegija Higher Education Institution (Lithuania);
dr. Ingrida Kraujutienė, Kauno Kolegija Higher Education Institution (Lithuania);
dr. Andrėja Raminta Ligeikienė, Kauno Kolegija Higher Education Institution (Lithuania);
dr. Vaclovas Makūnas, Kauno Kolegija Higher Education Institution (Lithuania);
dr. Viktorija Piščalkienė, Kauno Kolegija Higher Education Institution (Lithuania);
dr. Rimantas Plėštys, Kauno Kolegija Higher Education Institution (Lithuania);
dr. Donatas Rekus, Kauno Kolegija Higher Education Institution (Lithuania);
dr. Vidmantas Rimavičius, Kauno Kolegija Higher Education Institution (Lithuania);
dr. Daiva Sajek, Kauno Kolegija Higher Education Institution (Lithuania);
dr. Irma Spūdytė, Kauno Kolegija Higher Education Institution (Lithuania);
dr. Aušra Steponavičienė, Kauno Kolegija Higher Education Institution (Lithuania);
dr. Indrė Šikšnelytė-Butkienė, Kauno Kolegija Higher Education Institution (Lithuania);
dr. Aušra Šimonėlienė, Kauno Kolegija Higher Education Institution (Lithuania);
dr. Vilma Šipailaitė-Ramoškienė, Kauno Kolegija Higher Education Institution (Lithuania);
dr. Laima Jasevičiūtė-Ufartienė, Kauno Kolegija Higher Education Institution (Lithuania);
dr. Inga Valentinienė, Kauno Kolegija Higher Education Institution (Lithuania);
dr. Goran Avlijaš, Singidunum University (Serbia);
dr. Refael Barkan, Holon Institute of Technology (Israel);
Prof. dr. Lavinia Buruleanu, Valahia University of Targoviste (Romania);
dr. Margarita Dancheva, College of Management, Trade and Marketing (Bulgaria);
Prof. dr. Andrejs Domkins, Forest and Wood Products Research and Development Institute (Latvia);
dr. Hilmar Þór Hilmarsson, University of Akureyri, School of Business and Science, Iceland;
dr. Jana Ižvoltova, University of Zilina (Slovakia);
dr. Guy Yoskovitz, Holon Institute of Technology (Israel);
Prof. dr. Afam Jideani, University of Venda (Republic of South Africa);
dr. Daiga Kunkulberga, Latvia University of Agriculture (Latvia);
dr. Lilyana Nacheva, Agricultural University – Plovdiv (Bulgaria);
Prof. dr. Marco Dalla Rosa, University of Bologna (Italy);
dr. Olga Sych, Ivan Franko National University of Lviv (Ukraine);
Prof. dr. Dianne Helen Welsh, the University of North Carolina at Greensboro (USA).

English language edited by Danutė Lukaševičiūtė.

INTRODUCTION

Innovative (Eco-)Technology, Entrepreneurship and Regional Development (IECOTERD)

An ever more modern world is posed by more and more challenges, which are offset by improving technologies. Climate change, the green course, the 4th industrial revolution, artificial intelligence - how can we stay up to date with daily changes, how can we adapt to ever evolving industry and society?

The challenges posed to the established norms by new generations, the need to increasingly combine personal life and work, remote work opportunities, career changes, continuous learning - what's next?

Is a green product always sustainable and does sustainable mean the same as eco-friendly? How can we move from a consumerism-based economy to a circular one, where used goods are effectively recycled, how can we eat healthier? How will the human body change if machines take on most physical work? Could a changing climate provide new opportunities, how can we not cross a red line?

The annual conference invites the scholars, practitioners, experts from Europe and all around the world to discuss the issues of technological innovations, eco-innovations and technology-based entrepreneurship as drivers for economic growth and social change in regions. Exclusive attention is paid to ecological technologies and sustainable regional development.

This event is organized by Kauno kolegija Higher Education Institution in collaboration with the Manufacturing Innovation Valley (Lithuania).

Major topics of the Conference include:

- advanced technologies, smart cities and regions (in a line with economic, social, health and environmental transformations);
- (eco-) technological innovations (renewable energy, healthy nutrition, etc.) and change in a region;
- good practice of technology-based entrepreneurship.

On behalf of the IECOTERD Scientific Committee
Irma Spūdytė

INNOVATIVE (ECO-)TECHNOLOGY, ENTREPRENEURSHIP AND REGIONAL DEVELOPMENT (IECOTERD) CONFERENCE PROGRAMME

09.00–10.00 REGISTRATION

10.00–10.15 Welcoming Address and Opening of the Conference

dr. Andrius Brusokas, Director of Kauno kolegija Higher Education Institution, Lithuania

10.15–12.45 Parallel Sessions

12.45–13.30 LUNCH

13.30–14.00 Atlas of Human Settlements: monitoring built-up change in the Baltic States and Kaliningrad

dr. Georgios Ouzounis, Atlas AI, United States of America

14.00–14.30 Public Support for Renewable Energy and Green Policies: Insights from U.S. & Global Surveys

dr. Marija Verner, Yale Program for Climate Change Communication, United States of America

14.30–15.00 Preparing for Success in Life. Are You in Control?

dr. Kevin Howell, Appalachian State University, United States of America

15.00–15.30 FINAL SESSION

TABLE OF CONTENTS

ATLAS OF HUMAN SETTLEMENTS - MONITORING BUILT-UP CHANGE IN THE BALTIC STATES AND KALININGRAD

Georgios K. Ouzounis8

PREPARING FOR SUCCESS IN LIFE: ARE YOU IN CONTROL?

Kevin R. Howell9

INTERACTION OF BUSINESS, ECONOMY AND EDUCATION

THE EFFECT OF FINANCIAL SPECULATION ON DAIRY COMMODITY RETURNS BEFORE AND DURING THE PANDEMIC

Algirdas Justinas Staugaitis10

RELATIONSHIPS BETWEEN JOB DESIGN AND EMPLOYEE WELL-BEING IN ROBOTIC WORKPLACES

Karolina Kukcinavičiūtė11

FACTORS FORMING THE SATISFACTION WITH FAST FOOD BRAND: THE CASE OF "FOOD ON FOOT"

Raminta Andrėja Ligeikienė, Dalia Ilevičienė13

SORTING ELECTRONIC CIGARETTES: WHAT LITHUANIAN YOUTH KNOW ABOUT IT?

Rasa Bartkutė, Airida Gotautė14

AVAILABILITY OF SUPPORT TO HIGHER EDUCATION INSTITUTION KAUNO KOLEGIJA STUDENTS INVOKING INFORMATION DISSEMINATION

Rasa Gaižiūnaitė, Daiva Stankevičiūtė-Volkauskienė15

MISSION OF COLLEGES OF HIGHER EDUCATION IN LITHUANIA

Vytautas Liesionis.....16

CHANGE OF STUDENTS FINANCIAL LITERACY KNOWLEDGE IN KAUNO KOLEGIJA HIGHER EDUCATION INSTITUTION 2022-2023

Gintarė Jurkševičiūtė, Vilma Morkūnienė, Aušra Žvironienė, Jovita Danielytė.....17

THE APPLICATION OF INFORMATION TECHNOLOGY FOR LINGUISTIC LANDSCAPE RESEARCH

Aidas Gudaitis, Renata Gudaitienė19

MARKETING SOLUTIONS TO INCREASE AUDIENCE ENGAGEMENT ON FACEBOOK

Vitalija Vanagienė, Viktorija Navickienė, Dovydas Mačiulis20

TECHNOLOGICAL SOLUTIONS FOR SUSTAINABLE DEVELOPMENT AND QUALITY ASSURANCE

POSSIBILITIES OF USING LARGE SCALE SOLAR POWER PLANT IN THE CONTEXT OF ELECTROMOBILES DEVELOPMENT

Giedrius Gecevičius21

THE EFFECT OF TOOL WEAR ON PINE WOOD SURFACE ROUGHNESS

Gintaras Keturakis, Žygimantas Kujalavičius.....22

ENHANCING AUTOMATION SKILLS DEVELOPMENT BY INTEGRATING DIGITAL TWIN TOOLS INTO PLC TRAINING PROCESS

Giedrius Blažiūnas23

IMPROVEMENT OF ROBOTICS TRAINING USING DIGITAL TWINS TECHNOLOGY. VR-PLC TRAIN THE TRAINERS PROJECT USER CASE

Laimonas Kairiūkštis.....24

METROLOGY CHALLENGES IN IMPLEMENTING DIGITAL CALIBRATION CERTIFICATES FOR INTERNET OF THINGS MEASUREMENT (IOTM) DEVICES

Laimonas Kairiūkštis.....25

DETERMINING THE PROPORTION OF INNOVATIVE METAL TRUSSES IN THE RATIONAL DESIGN OF SUSTAINABLE STRUCTURES

Jūratė Mockienė, Aras Kantautas26

FOOD TECHNOLOGIES, AGRO-INNOVATIONS AND CONSUMPTION TENDENCIES

CHANGE OF THE CHARACTERISTICS OF WILD BLUEBERRY PASTILLES IN RESPONSE TO CONSUMERS' NEEDS

Ingrida Kraujutienė, Rasa Volskienė, Annemie Froyen, Sem Hansen.....27

QUANTITATIVE ASSESSMENT OF PHYTONUTRIENTS IN BLUEBERRIES

Inga Pupelienė, Ilona Šostakienė28

EFFECT OF LED LAMP ON CUCUMBER YIELD AND THEIR QUALITY

Donatas Klimavičius29

ANALYSIS OF GRAIN STORAGE TECHNOLOGIES IN THE ELEVATORS OF AGROKONCERNO GRŪDAI, UAB

Irena Tulabienė31

FARMERS' ENVIRONMENTAL SUSTAINABILITY BEHAVIOUR

Jurgita Zaleckienė, Renatas Puška32

DETERMINATION OF THE AREA INDEX OF LETTUCE LEAVES WITH MONOCULAR CAMERA Laimonas Kairiūkštis, Başak Yalçiner, Emre Özkul	33
ENERGY-RELATED CARBON DIOXIDE EMISSIONS IN LITHUANIAN AGRICULTURE AND FORESTRY: RESULTS OF DIVISIA INDEX-BASED DECOMPOSITION ANALYSIS Daiva Makutėnienė, Valdemaras Makutėnas	34
BROADBAND INTERNET TECHNOLOGIES	
NATIONAL STRATEGY AND MEASURES IN THE FIELD OF BROADBAND DEVELOPMENT Albertas Turonis	35
EU REGULATORY MEASURES TO ENSURE OPEN INTERNET ACCESS AND TO ACHIEVE GIGABIT SOCIETY OBJECTIVES Virginijus Stundžia	36
PUBLIC INSTITUTION PLAČIAJUOSTIS INTERNETAS. BROADBAND DEVELOPMENT PROJECTS IN COMMERCIALY UNATTRACTIVE RURAL AND REMOTE AREAS OF LITHUANIA Gytis Liaugminas, Eglė Misienė, Donatas Bernatoniš, Jolanta Kavaliūnaitė	37
PASSIVE OPTICAL CABLES: THE PRESENT AND THE FUTURE Vilmantas Vasiliauskas	38
IT SECTOR BUSINESS DEVELOPMENT IN REGIONS: PROS AND CONS Linas Prušinskas	39
METHOD OF CALCULATING OF PASSIVE OPTICAL TRUNK SIGNAL LEVELS Rimantas Plėštys, Jurgita Dabulytė-Bagdonavičienė, Gintaras Butkus	40
ANALYSIS OF ENERGY EFFICIENCY OF OPTICAL DATA TRANSMISSION TECHNOLOGIES Rimantas Plėštys, Vidmantas Rimavičius	41

ATLAS OF HUMAN SETTLEMENTS - MONITORING BUILT-UP CHANGE IN THE BALTIC STATES AND KALININGRAD

dr. Georgios K. Ouzounis

Atlas AI, USA

georgios@atlasai.us

Abstract

Relevance of the presentation topic: Human settlements are the footprints of the anthropogenic environment and knowledge of their extent and fabric is often the first and most important prerequisite in socio-economic analytics. Living conditions, demographics, transportation patterns, economic activity, development trends and more, are some of the key indicators allowing us to sketch the greater picture and get a more holistic view of any habituated environment across the world. Human settlements observed in overhead imagery (aerial/satellite) can be described by a rich pool of features that include spatial extent, built-up types, heights and density, infrastructure, non-built-up related land use and land cover, mobility and beyond. Tracking these features over regular time intervals presents us with the settlement dynamics and helps us unlock insights and generate actionable information layers at scale.

The Atlas of Human Settlements is a built-up basemap of global coverage, delivered at 10m spatial resolution and updated annually, with legacy layers since 2016. It consists of a number of semantic layers imprinting key attributes describing settlement extent and fabric. This work demonstrates selected AHS layers produced over the Baltic States and Kaliningrad and showcases examples of change detection with respect to built-up.

Methodology: The AHS is built using cutting edge AI for multi-spectral satellite image segmentation and regression. Using an advanced encoder-decoder network topology we train a model that correlates the percentage of built-up within a spatial unit of 10x10m² in size, with the pixel content. During model inference, we produce two estimates; the Built-up Index that measures the percentage of built-up in any new, previously unseen spatial unit, and the Built-up Confidence that reports the model's certainty that any given spatial unit contains buildings.

Results: AHS is currently under evaluation and only empirical findings can be reported from randomly selected areas of interest across the globe. The first is that all types of built-up are systematically detected in the entirety of the evaluation scenes leaving no building behind. This suggests a very high recall. The second is that minor true positives can be witnessed at very close proximity to buildings which is due to imperfections in the training data. This has an impact in precision but it is moderated with the use of land cover masks. The third is that AHS outperforms by a large margin in both metrics, the only other alternative which is the Global Human Settlement Layer of the European Commission.

Conclusions & practical implications: AHS is a valuable instrument in understanding the highly dynamic nature of human settlements in a rapidly changing environment where geopolitical factors, climate change and economic/developmental trends influence the living/migration patterns and conditions of millions of people across the world at an ever increasing rate.

Keywords: human-settlement, urban, built-up, satellite-imagery, artificial-intelligence.

PREPARING FOR SUCCESS IN LIFE: ARE YOU IN CONTROL?

dr. Kevin R. Howell

Appalachian State University, USA

howellkr@appstate.edu

Abstract

Relevance of the presentation topic: This presentation was developed to inform and change individual thinking about success and the factors that affect opportunities for success in life. There are many factors that individuals have no control over in terms of their path in life. Persons who start adulthood are at the mercy of the economic climate of that particular era. Imagine the opportunities presented to a person starting their adult life during the Black Plague of 1350 in London or China compared to a person starting their adult life in the Eastern part of the United States 500 years later. There are many things that are in one's control. Hard work and attention to detail are universal requirements for success no matter what era or geographic location one finds themselves.

Methodology: This presentation reports on an analysis of literature that began with the inspiration of Malcolm Gladwell's book *Outliers*. Gladwell's foundation led to the investigation of historical data about desirable and undesirable times in history to be born. The concepts of hard work and attention to detail are founded in Thomas Edison's adage that "Opportunity is often missed because it is dressed in overalls and looks like work", and Fredrick Taylor's *Principles of Scientific Management*. These concepts are illustrated with modern day examples of success and failure due to the adherence or lack of adherence to those ideals.

Results: There is no time in history that presents individuals an opportunity for success in life. It is up to every individual to put forth the appropriate effort and pay attention to the details in that work to find the maximum level of success that that era would allow. Certainly, there are times where success is much more widespread and more easily attainable. There has never been an era where success is universal without regard to effort.

Conclusions & practical implications: Every person should, at the very least, be aware of the head start or lack thereof that they were afforded purely by chance in life. Whether it is the month they were born, the year they were born, the color of their skin or their latitude and or longitude. Success in life is a series of fortunate events shaped by a combination of chance and individual effort.

Keywords: success, work, motivation, entrepreneurship, attention to detail.

THE EFFECT OF FINANCIAL SPECULATION ON DAIRY COMMODITY RETURNS BEFORE AND DURING THE PANDEMIC

Algirdas Justinas Staugaitis

*Kauno kolegija Higher Education Institution, Lithuania
algirdas.staugaitis@go.kauko.lt*

Abstract

Relevance of the presentation topic: Driven by the price spikes and fluctuations in major commodity markets over the past few years, the study explores whether financial speculation destabilising commodity prices even further. The study focuses more closely on US dairy futures markets, which are relatively new compared to other agricultural commodity markets and have received less attention from other researchers in their studies. These markets play an important role for dairy producers and manufacturers by providing the opportunity to hedge against market risks, and these risks are particularly significant when the economy is in a state of turmoil and uncertainty, such as in the post-COVID-19 timeframe.

Methodology: The Augmented Dickey Fuller (ADF) test, the Granger non-causality test, and the generalised autoregressive conditional heteroskedasticity (GARCH) approach are used in the study. The analysis uses the weekly returns on the nonfat milk, butter, milk class III, and cheese futures contracts from the Chicago Mercantile Exchange.

Results: The analysis's findings show that, despite the fact that some commodities' return volatility increased during the post-2020 period, financial speculation, which was modelled as an exogenous factor, either has a minimal impact or, in some cases, even decreases the volatility of dairy futures prices.

Conclusions & practical implications: Research results suggest that either there is no causal relationship between the rise in non-commercial market participants (speculators) and the increased volatility of dairy commodity prices or that the relationship is the exact opposite, with a rise in non-commercial market participants contributing to greater market liquidity and better-distributed price risks. The market for dairy futures contracts plays a significant role in controlling price risks for both dairy farmers and marketers. Therefore, the findings of this study have significant practical implications for how to regulate financial speculation in commodity markets.

Keywords: agricultural futures, commodity futures markets, dairy futures, financial speculation, return volatility.

RELATIONSHIPS BETWEEN JOB DESIGN AND EMPLOYEE WELL-BEING IN ROBOTIC WORKPLACES

Karolina Kukcinavičiūtė

*Kauno kolegija Higher Education Institution, Lithuania
karolina.kukcinaviciute@go.kauko.lt*

Abstract

Relevance of the presentation topic: In a changing world of technology, the pace of improvement is getting faster and faster. Some manual tasks have been replaced by machines that made people's work easier and made the companies more productive. The industrial revolution that has taken over human lives today has shifted to the robotisation of the manufacturing process. The process of production robotization involves not only industry but also services such as food supply industry, automation of educational services, etc. All these developments have brought changes not only to the companies in which the workplace is being robotised, but also to the employees in those companies. Some workers are concerned that they will soon be replaced by robots and will lose their jobs. Others hope that technology will improve their working conditions. However, one thing is clear: workers will have to accept the idea that decades of work methods are no longer appropriate and that new skills are needed to work with new technologies. The design of employee movement flow in those companies changes accordingly, facilitating their specific duties and improving their well-being. Thus, the aim of this paper is to reveal relationships between workplace design and employee well-being in robotic workplaces.

Methodology: Analysis of scientific literature sources, online questionnaire, graphical and statistical data analysis. The research method is an empirical quantitative study. The data collection method is a written survey. The questionnaire consists of 13 categories of statements, with 8 to 12 statements in each category. Each statement is rated on a Likert scale. The questionnaire also contains 7 demographic questions. The study sample was determined based on the sample size calculator in the online space. The survey received responses from 408 respondents working in robotised workplaces.

Results: The results of the study showed that the theoretical model is consistent with the results of the study. The relationships between the workplace design and the dimensions of stress, burnout, organization confidence, job satisfaction are statistically significant. Although not all dimensions of the workplace design are statistically correlated with the dimensions of stress, burnout, job satisfaction, the overall relationships between workplace design and the dimensions of burnout, organization confidence, job satisfaction is statistically significant. The relationships between workplace design and the stress dimension is considered to be positively moderately strong, the burnout dimension is considered to be negatively weak, the organization confidence dimension is positively strong, and the job satisfaction dimension is positively moderately strong.

Conclusions & practical implications: After assessing the reliability of the measurement scales, it was found that the research questionnaire is reliable. After performing the factor analysis, the reliability of the measurement scales was clarified. Frequency analysis allowed for a more detailed examination of the demographics of the respondents. The analysis of the comparison of the averages made it possible to find out that the overall average of the job design construct is higher than the average. The analysis of the distribution of averages in the context of demographic indicators revealed that there is no noticeable difference

between the construct of the job design and the dimensions of employee well-being by gender. Correlation analysis made it possible to determine that the relationship between the job design construct and the dimensions of stress, burnout, organization confidence, and job satisfaction is statistically significant and all these dimensions are correlated with the job design construct.

Most of the authors in their studies examine some one construct or dimension, and this study includes both the construct of the job design and the dimensions of employee well-being. In addition, there is very little research that examines the relationship between the job design and employee well-being specifically in robotic workplaces, as this is not an old research area. However, this study has some limitations. The research questionnaire consists of a very large number of statements/questions, so a small number of employees want to devote so much time to filling out the questionnaire. Consideration should be given to shortening the questionnaire.

Keywords: human resources management, job design, employee well-being, robotics in the workplace, relationships.

FACTORS FORMING THE SATISFACTION WITH FAST FOOD BRAND: THE CASE OF "FOOD ON FOOT"

dr. Raminta Andrėja Ligeikienė, Dalia Ilevičienė

*Kauno kolegija Higher Education Institution, Lithuania
raminta.ligeikiene@go.kauko.lt, dalia.ileviciene@go.kauko.lt*

Abstract

Relevance of the presentation topic: Fast food brands in recent years are characterized by a change in consumer attitudes. The change in attitudes is influenced by trends in lifestyle, the nature of consumption and the factors that shape branding. The conducted study of the attitude of students to the fast food brand made it possible to single out the following main factors that form satisfaction: the characteristics of the product and packaging. In detailing the characteristics of the product, the following main characteristics can be named: the quality of sandwich bread, a wide range of sandwiches and the ability to quench hunger. The overall assessment of satisfaction with the fast food brand is carried out using the Net promoter score (NPS). The application of NPS is typical for businesses seeking to assess the level of consumer satisfaction. Net promoter score is becoming increasingly important for a brand success. This indicator was also used to evaluate the "Food on the Foot" brand among the students as a target group.

Methodology: The survey questionnaire method was applied to research the students' opinion about "Food on the Foot" brand. During the research, 302 filled questionnaires were received. Monkey Survey program was applied for the data collection and analyses.

Results: The results of the research revealed that more than 70 percent of students have tasted sandwiches of the analyzed brand. The decision of consumers not to taste or buy sandwiches was determined by the price and negative attitude towards fast food. And the main reason for the purchase is the ability to grab a fast snack, what directly correlates with the basic concept of the brand.

Conclusions & practical implications: The NPS of the "Food on the Foot" brand is positive. The assessment of the factors, that shape the consumer satisfaction, confirmed the concept of marketing communication. The results of the research are significant for improving brand communication among the students as a target group, and implementing the marketing concept.

Keywords: net promoter score (NPS), key factors of consumer satisfaction, fast food brand.

SORTING ELECTRONIC CIGARETTES: WHAT LITHUANIAN YOUTH KNOW ABOUT IT?

dr. Rasa Bartkutė, Airida Gotautė

*Kauno kolegija Higher Education Institution, Lithuania
rasa.bartkute@go.kauko.lt*

Abstract

Relevance of the presentation topic: The world is faced with the problems of waste management in the fight against climate change. Recently, one of the fundamental problems of waste sorting, both globally, in the EU, and in Lithuania, is the sorting of electronic waste. The amount of electrical and electronic waste is growing the fastest in the EU, and less than 40% of it is recycled. (European Parliament, 2020). The use of electronic cigarettes is rapidly spreading among young people. According to European Parliament 2020 data, only 14.6% of consumer equipment (which includes e-cigarettes) was collected across the EU. This sorting problem is also relevant to Lithuania. There are still very few scientific studies that analyze the problem of sorting electronic cigarettes.

Methodology: The purpose of the study is to determine the knowledge and attitude of Lithuanian youth aged 18 to 39 towards the sorting of disposable electronic cigarettes. Used methods: analysis of scientific literature, quantitative research, using the survey method.

Results: A representative study was conducted. Interesting and quite controversial research data were obtained. After surveying 406 respondents, it was found that every second respondent does not know, has no information, how to correctly sort disposable electronic cigarettes. It can also be said that the respondents themselves critically assess their knowledge, as well as the sufficiency of information. During the study, only 21.4 percent of respondents stated that for them, information about the sorting of e-cigarettes that are no longer suitable is completely sufficient or sufficient. 53% indicated that they lack information on how to properly sort disposable electronic cigarettes. It is noteworthy that not only is there no information on how to properly sort disposable electronic cigarettes, but the majority of the research participants themselves claim that they have sufficient knowledge of how to sort electronic waste in general. On a 10-point Likert scale, the respondents rated their knowledge about e-waste sorting at an average of 7.5 points. One of the ways to properly sort disposable electronic cigarettes in Lithuania is to return them to bulky waste collection sites. During the survey, only 11.3% of respondents were aware of this method of collecting unusable electronic cigarettes.

Conclusions & practical implications: Such contradictory survey findings suggest the need to create an information transfer and communication management system to provide with sufficient knowledge about the sorting of electronic cigarettes (in particular disposable smoking devices). Electronic cigarettes are classified as small electronic waste. However, given the increasing number of users of these devices among young people, it is useful to distinguish the category of e-cigarette waste from the general category of small electronic waste, taking into account the very short lifetime of e-cigarettes (compared to other small electronic waste).

Keywords: waste management; electronic waste, e-cigarettes, e-cigarettes waste.

AVAILABILITY OF SUPPORT TO HIGHER EDUCATION INSTITUTION KAUNO KOLEGIJA STUDENTS INVOKING INFORMATION DISSEMINATION

Rasa Gaižiūnaitė, Daiva Stankevičiūtė-Volkauskienė

Kauno kolegija Higher Education Institution, Lithuania

rasa.gaiziunaite@go.kauko.lt, daiva.stankeviciute-volkauskiene@go.kauko.lt

Abstract

Relevance of the presentation topic: The research aims to reveal how effectively the availability of support for students is functioning in the case of Lithuanian Higher Education Institution Kauno Kolegija (HEIKK). From a theoretical point of view, in the context of the needs of a higher education institution are viewed from two angles: concepts of support and information dissemination. Empirical research is focused on the links between the analysis of documents in the higher education space (Europe, country, institution) and the content analysis of HEIKK information dissemination tools. A questionnaire survey method has been used to find out the target audience – students – personal views on the relevance of support services and the need for information dissemination tools within the institution.

Methodology: Analysis of scientific literature, document analysis, content analysis, questionnaire survey, case analysis.

Results: The results of the research revealed that the academic and non-academic support system in HEIKK prevails, which is compatible with the needs of the European higher education space and operates on the “one-stop-shop” principle. The results of the research also revealed that the dissemination of information should be focused on Generation Z as the media generation uses an individualizing service publicity strategy.

Conclusions & practical implications: At the theoretical level of analysis, the concept of support is focused on the types of academic and non-academic services according to the consensus of the HEIKK community. Since the 2021 / 2022 academic year the support system for students has been under development. Also, at the theoretical level of analysis, the concept of information dissemination is defined through classical approaches to the process and meaning creation, so that at the empirical level it is possible to identify how the information dissemination about the support of the institution's communication channels and/or means to the target audience of students takes place, how/what information needs are expressed by the students themselves. The document analysis reveals that HEIKK's support for students functions based on the institution's strategic actions, which are compatible with the European and national higher education space. Survey data can help improve HEIKK documents related to the support system and the dissemination of information about support services.

Keywords: support, academic support, non-academic support, dissemination of information.

MISSION OF COLLEGES OF HIGHER EDUCATION IN LITHUANIA

dr. Vytautas Liesionis

Kauno kolegija Higher Education Institution, Lithuania
vytautas.liesionis@go.kauko.lt

Abstract

Relevance of the presentation topic: In recent years Lithuanian higher education is facing major changes. The structural ones are minor compared to the change of expectations and requirements to the college mission. The Parliament of the Republic of Lithuania in 2022 adopted amendments to the Law on Science and Studies as a matter of urgency. "The most significant amendments deal with what is described as "purging college missions." As a result of these missions, amendments to the law were passed as a matter of urgency, which means without further discussion. The need to refine missions is linked to commitments in the so-called RRF financing plan (the 'Recovery and Resilience Facility'), with €20 million earmarked for this purpose. The measure provides for "refining the missions of universities and colleges, the requirements for the quality of their activities, differentiating the competencies provided by the binary system of higher education". (Putinaitė, 2022).

Methodology: The object of the study is the mission of the colleges of higher education. The aim is to determine the coherence of the missions and objectives of Lithuanian state colleges with the provisions of LSS. Tasks: 1) To reveal the importance and essence of the mission. 2) To determine the compliance of college missions with the provisions of LSS. Research methods include analysis, systematisation and generalisation of literature, qualitative analysis of the content.

Results: The coherence of the missions of colleges with the provisions of LSS of 12 state colleges was analysed. Four provisions defining the mission of colleges were used: 1) Non-university studies prevail... 2) ... the development of applied research and/or applied scientific activities or professional arts... 3) Social responsibility is associated with the sustainable development of the region in cooperation with groups of representatives of the local community, business and government... 4) ... developing the capacity of the individual and the community to think and act independently and creatively.

Conclusions & practical implications: The coherence of the missions of colleges with the provisions of LSS is one of the possible criteria for assessing the prospects of the college sector. The missions of the state colleges analysed do not fully cover the provisions of the LSS. The field of applied research and /or applied scientific activity or professional art stands out in particular.

Keywords: higher education, college, mission.

CHANGE OF STUDENTS FINANCIAL LITERACY KNOWLEDGE IN KAUNO KOLEGIJA HIGHER EDUCATION INSTITUTION 2022-2023

**Gintarė Jurkševičiūtė, dr. Vilma Morkūnienė,
dr. Aušra Žvironienė, dr. Jovita Danielytė**

Kauno kolegija Higher Education Institution, Lithuania
gintare.jurksevicute@go.kauko.lt, vilma.morkuniene@go.kauko.lt
ausra.zvironiene@go.kauko.lt, jovita.danielyte@go.kauko.lt

Abstract

Relevance of the presentation topic: Financial literacy (FL) can help you manage your money more effectively and achieve financial security and independence – it is essential for making important life decisions. This is especially important for students who are just starting their financial life. A study was conducted in 2022 to assess the level of FL of first-year students at Kauno kolegija Higher Education Institution (KK HEI). The survey was repeated in 2023 to assess changes.

Methodology: A questionnaire survey was used as a research method. The questionnaire consisted of 57 questions: 12 general questions and 45 questions related to FL and divided into 4 groups: budget, credit and debt, savings and investments, and financial responsibility. A targeted anonymous survey was conducted in May-June of 2022 and May of 2023. 219 students in the 1st year of the KK HEI Technology and Business faculties were interviewed in 2022 and 150 in 2023. SPSS software and MS Excel were used for statistical analysis of the survey data. To calculate the FL Index, each correct answer in the questionnaire (designed to test knowledge) was given a score of 0-2 (the maximum score was 83). Numerical characteristics were used to estimate the FL Index, showing the distribution of values among all respondents. The change in the results of the 2022 and 2023 surveys was assessed.

Results: Comparing the 2022/2023 respondents, the following differences emerged: more respondents (8.5% vs 22.7%) live on savings; fewer have good financial habits (70.3% vs 50.3%); the concept of borrowing has changed (in case of shortage of money, there is a tendency to cut down on spending rather than borrowing from family members (25% vs 20%) or from credit institutions (0.5% vs 0%)); and the perspective on saving has changed (4.6% vs 10.6% are not saving, while the number of those who save on a regular basis has increased to 46.6% vs 50.7%). Less respondents were involved in managing family finances (32% vs 46%), but they were more likely to learn about finances on their own (23.7% vs 76.3%). Budgeting skills have worsened (income equal to (19.2% vs 24%) or less than expenditure (45.2% vs 42.7%). There was an increase in those who are investing now (27.9% vs 48%) and those who are planning to invest in the future (65.8% vs 81.3%) in more risky products such as shares. Life experience and parents are the main contributors to the development of financial management skills, where no change is observed.

Conclusions & practical implications: The general FL knowledge of the students who participated in the 2023 survey is adequate, but at different levels. In 2022, there were some students with very low levels of FL and others with fairly high levels. When comparing the FR Index obtained in 2023, it is slightly lower than in 2022. The study found that students would also be more inclined to invest in financial areas that they can influence/control themselves rather than in financial instruments that depend on external

environmental decisions. Respondents believe that FL needs to be developed on an ongoing basis, both formally and informally.

Keywords: students' financial literacy, index of financial literacy.

THE APPLICATION OF INFORMATION TECHNOLOGY FOR LINGUISTIC LANDSCAPE RESEARCH

Aidas Gudaitis¹, dr. Renata Gudaitienė²

¹*Institute of the Lithuanian Language*, ²*Kauno kolegija Higher Education Institution, Lithuania*
aidas.gudaitis@lki.lt, renata.gudaitiene@go.kauko.lt

Abstract

Relevance of the presentation topic: Analysing the issue of the Lithuanian-Slavic ethnolinguistic boundary change in southeastern Lithuania, it is observed an obvious lack of statistically based quantitative research that evaluates the ethnolinguistic transformation processes in this multilingual environment. The need to analyse these processes is crucial in shaping educational policies as well as assessing potential geopolitical threats. Most of the published articles of linguistic research in this region are often fragmentary and based on qualitative methods. Therefore, a comprehensive quantitative study using modern information technologies could significantly enhance the assessment of linguistic changes in this region. For a more unprejudiced assessment of the situation, a linguistic landscape study was conducted. A linguistic landscape could be defined as the entirety of linguistic environmental elements of written language in a specific geographical location (e.g., advertising boards, informational signs, inscriptions on monuments, tombstones, etc.). The aim of this study was to investigate the dynamics of Lithuanian-Slavic ethnolinguistic boundaries by analysing the linguistic landscape and applying GIS based information technologies and geo-spatial analysis techniques in southeastern Lithuania.

Methodology: For the linguistic landscape research geospatial analysis methods based on GIS were employed. To analyse the ethnolinguistic change over time and space in the assessed area, as an indicator, one of the elements of the linguistic landscape – tombstone inscriptions, was selected. A mobile application for data collection in the field was developed. The data were statistically processed using quantitative analysis.

Results: To collect more objective information about the language attitudes of residents living on the Lithuanian-Slavic language border, a geospatial model for researching tombstone inscriptions was developed. GIS-based information technology tools were created for data collection, processing, and analysis. Statistical analysis was performed, and the information was represented through maps and graphs.

Conclusions & practical implications: The study revealed that the use of IT-based quantitative methods improved the objectivity and efficiency of the assessment in the research area, preventing subjective assessment by observers and enabling the assessment of ethnolinguistic change trends from a temporal and spatial perspective. Data analysis indicated that in the researched ethnolinguistic boundary zone of the Varėna-Šalčininkai municipalities in southeastern Lithuania, Lithuanian-Slavic language change is not significant, and the collected linguistic landscape material correlates with the findings presented by other authors alongside with demographic data of general population census of 2021.

Keywords: geospatial analysis, linguistic landscape, information technologies, GIS.

MARKETING SOLUTIONS TO INCREASE AUDIENCE ENGAGEMENT ON FACEBOOK

dr. Vitalija Vanagienė, Viktorija Navickienė, Dovydas Mačiulis

Kauno kolegija Higher Education Institution, Lithuania

vitalija.vanagiene@go.kauko.lt, viktorija.navickiene@go.kauko.lt, dovydas.mac983@go.kauko.lt

Abstract

Relevance of the presentation topic: Facebook is one of the world's largest digital advertising platforms, serving billions of users and businesses worldwide. Understanding and adapting marketing solutions for increasing audience engagement to modern and dynamic communication, changing market, and environmental conditions is a very important step in the company's social network marketing communication and sales strategy. In addition, responding to relevant content for the target audience at the right time, researching user impressions and their behavior is crucial. An insightful and constant analysis of Facebook marketing solutions helps the company's marketing specialists to create more accurate and effective Facebook marketing communication campaigns, to understand whether their marketing solutions and investments in Facebook advertising are yielding the desired results and in which areas they still need to improve, responding to good experience, with the help of scientific and practical insights.

Methodology: A comparative analysis of scientific literature, a synthesis and a questionnaire survey of corporate Facebook users were used to analyze the topic and to determine what marketing solutions increase audience engagement on Facebook.

Results: The research provides new insights that can help marketers manage and optimize a company's presence on Facebook to engage existing and potential audiences.

Conclusions and practical implications: The research results show that the expectations of Facebook users are increasing for inclusive marketing solutions. Considering this, marketing specialists should actively study Facebook audience engagement and be interested in other researchers' latest research, Facebook marketing trends, and be ready to apply these aspects to the company's Facebook marketing communication strategy, constantly improving audience engagement.

Keywords: audience, facebook, engagement, marketing communication, strategy, solutions, sales.

POSSIBILITIES OF USING LARGE SCALE SOLAR POWER PLANT IN THE CONTEXT OF ELECTROMOBILES DEVELOPMENT

dr. Giedrius Gecevičius

*Kauno kolegija Higher Education Institution, Lithuania
giedrius.gecevicius@go.kauko.lt*

Abstract

Relevance of the presentation topic: In recent years, going through the energy crisis inevitably led to an increase in the prices of energy resources. In order to reduce costs for electricity, great attention was paid to increasing the efficiency of energy consumption. In addition, rising electricity prices have inevitably negatively affected the demand for electric vehicles due to rising travel costs. However, in order to move to the transformation of traditional cars into electric vehicles, it is worthy to produce electricity in solar power plants. Such a method allows not only to produce electricity cheaper than the market price, but also to significantly contribute to the development of electric cars in the country. The aim of this study is to analyse it is possible to provide a charging station for electric vehicles using solar power plants.

Methodology: The research analyses the possibility of large-scale and small-scale solar power plants to supply electricity, as well as the possibility of energy storage, the comparison of the costs of electric vehicles and the development prospects in comparison with cars powered by internal combustion engines.

Results: The results show that it is most economically beneficial to develop electric vehicle infrastructure where renewable energy source systems are used. Calculations present that evaluating the charging of electric vehicles at the equipped station - on average 16 kWh, maximum 62 kWh of electricity consumed during one charging. The amount of electricity produced by the small-scale photovoltaics varies between 3 and 745 kWh per month, while the electric vehicles charging station consumed between 3 and 261 kWh.

Conclusions & practical implications: The study presents that even the amount of energy produced by large-scale solar power plants is not enough to supply electric vehicles chargers during the winter period. Small-scale and large-scale photovoltaics can be used to charge electric vehicles' stations if an energy storage system is installed or the electricity is stored in the grid.

Keywords: renewable energy, electric vehicles, photovoltaics.

THE EFFECT OF TOOL WEAR ON PINE WOOD SURFACE ROUGHNESS

dr. Gintaras Keturakis, Žygimantas Kujalavičius

Kauno kolegija Higher Education Institution, Lithuania

gintaras.keturakis@go.kauko.lt, zygimantas.kujalavicius@go.kauko.lt

Abstract

Relevance of the presentation topic: In this study, the surface quality of pine wood (*Pinus sylvestris*) test pieces planned with experimental milling tools and influence of tool wear of quality of surface were examined. These tools were made by surfacing using a submerged arc welding (SAW) technique and a mixture of alloying elements (chromium, tungsten, ferro-manganese, silicon carbide) spread on the surface under industrial flux. Surface roughness was measured along and across wood fibre.

Methodology: The wood test pieces were obtained from pine grown in Lithuania; the lumber was first air dried, after drying in the laboratory oven it reached 10 % of average moisture content, and then it was trimmed to dimensions of 1000 x 100 x 20 mm with radial surface. Special attention was paid to select test pieces free of any possible natural wood defects, however it is difficult to avoid. Test pieces were conditioned at a average ambient temperature of $20 \pm 2^\circ\text{C}$ and $60 \pm 5\%$ relative humidity. Average roughness (R_a), mean peak-to valley height (R_z), and maximum roughness (R_{\max}) parameters were recorded and measured at intervals of cutting length 0; 50; 100; 150; 200; 400; 800; 1200; 1600; 2400 and 3200 m. Each value at every specified cutting length was an average of 5 tests. The stylus tip surface roughness tester, profilometer Mahr MarSurf PS1, was used to evaluate surface roughness parameters in radial direction.

Results: According to the results of experiments it is obvious that average roughness parameters along fibre is lower than across. Milling tool wear results revealed that 3200 m of cutting length is not significant for tools wear. The same can be said about tool nose width change – effect of negligible changes of tool edge geometry on planned surface quality is low. The feed of milling tool played a more significant role – twice higher feed rate per insert (from 0.5 mm to 1.00 mm) showed lower surface quality after planning. To reach necessary wood surface quality, lower feed rate and suggested experimental planning tool with higher wear resistance than commercial tool is preferable for planning of birch wood.

Conclusions & practical implications: Pine wood surface roughness directly depends on the anatomic characteristics of wood spieces, direction of wood grain and cutting tool characteristics. When using milling tool ET2 all surface roughness parameters in both wood grain directions were lower than using ET1. Pine wood surface roughness parameters for both experimental tools along wood fibre were approximately 1.4 times lower than parameters in the across direction. Twice higher feed per insert showed lower surface quality after planning. Reduced surface quality associates with changes of tool edge geometry, as on wear planning tools separate segments of edges crumbles away.

Keywords: planning, pine wood, surface roughness, wear, wear resistance.

ENHANCING AUTOMATION SKILLS DEVELOPMENT BY INTEGRATING DIGITAL TWIN TOOLS INTO PLC TRAINING PROCESS

dr. Giedrius Blažiūnas

*Kauno kolegija Higher Education Institution, Lithuania
giedrius.blaziunas@go.kauko.lt*

Abstract

Relevance of the topic: The integration of the digital twin into PLC training is an important element that represents the continuous global industry changes. The need for a competent workforce that can efficiently develop, run, and maintain automated systems is expanding as automation and digitalization progress. Integrating digital twin and simulation tools into PLC training helps meet this demand by giving them the knowledge and abilities necessary for employment in current industrial contexts. Using digital twin technology it is possible to create and simulate virtual models of physical systems. It enables students to study and practice automation principles in a secure and monitored virtual environment when incorporated into PLC education. Digital twin tools reduce hardware costs for training because of variation of physical equipment.

Methodology: Programming involves the use of certain basic functions to create a control sequence for a specific object. The mastery of these basics depends on several aspects: the theory, the trainer and the equipment used for instruction. The theory of PLC programming has not changed since the advent of PLCs and the development of software. The basic programming instructions have remained the same, the programming tool itself, its environment and user interface have been improved. As industrial automation equipment has evolved, new functions and libraries have been added to facilitate the user's programming of, for example, device communication, motion control or image recognition. To replicate industrial automation devices in the PLC programming process, it is necessary to have similar hardware. However, modern industry is characterised by different physical components and processes. This is where the most important gap is observed. Mastering automation technology requires a large number of different physical objects. Diverse and expensive hardware can be replaced by digital twin tools. These allow to create analogous physical systems in a virtual environment. The objects created with simulation tools have physical properties (gravity, magnetism, etc.) that influence the behaviour of the object during the simulation. Most importantly, each learner can be provided with a unique controllable object. In this way, the managed object can be customised based on complexity or industry-specific requirements.

Results: The PLC-Lab software package was put into use in the automation and robotics study programme at Kauno kolegija. This tool is used in modules that are associated with the use of PLV, i.e. automation of technological processes and technical systems and programmable control systems. PLC-Lab is integrated as a mandatory tool in students' theses.

Conclusions & practical implications: Using PLC-Lab together with Siemens TIA Portal allows the learner to become more immersed in developing PLC programming skills while creating various physical devices for practical and self-study work.

Keywords: digital twin, PLC programming, training.

IMPROVEMENT OF ROBOTICS TRAINING USING DIGITAL TWINS TECHNOLOGY. VR-PLC TRAIN THE TRAINERS PROJECT USER CASE

dr. Laimonas Kairiūkštis

*Kauno kolegija Higher Education Institution, Lithuania
laimonas.kairiukstis@go.kauko.lt*

Abstract

Relevance of the presentation topic: It is not surprising that digital, virtual reality devices are increasingly coming into our lives and it has already become a common thing for people. The youth learn smart tools and, in many cases, using these tools facilitates the study process and helps to acquire knowledge faster. The young generation is very independent, and the role of the teacher becomes more similar to that of a mentor who must adapt to the changed teaching conditions. When studying technical subjects, we are faced with a large amount of information that needs to be conveyed to the learner. Typically, the least amount of information is transmitted verbally, whereas the largest part of information can be conveyed using video or other graphic representation methods. In the VR-PLC project, researchers present a new way of studying robotics and programmable logic controllers (PLCs) using new technologies. New teaching methods require the use of appropriate software and hardware. In this place, one of the possible solutions is the joint use of virtual reality glasses and Digital Twin software which is presented in this paper.

Methodology: A literature review on the latest offline robotics teaching methods and software. The presentation introduces the VR-Train software, which uses Digital Twin technology for robotics training, developed by Kaunas College and its partners.

Results: A detailed literature review on the latest offline robotics teaching methods and software is presented. The introduction of the VR-Train software, which uses Digital Twin technology for robotics training, developed by Kaunas College and its partners is presented. The VR-PLC software for robotics training is currently being tested for integration into the Robotics subject at Kaunas College. After the first tests, it is planned to apply this software to commercial activities by teaching company employees who do not even have the basic knowledge to work with robots.

Conclusions & practical implications: The Digital Twin technology enables quick assimilation of training knowledge in the shortest time, so it will be a decisive factor in solving unemployment problems during the industry transition period. A robotics training solution using VR-PLC software could be applied not only to college students, but also to company employees who upgrade their qualifications. Digital Twin technology enables quick assimilation of training knowledge in the shortest time, so it will be a decisive factor in solving unemployment problems during the transition period. The suggested teaching approach can be suitable for use in study programs of all levels, because the mentor can choose how much teaching material needs to be delivered. One of the advantages of this system is that the more advanced students do not have to wait for others and can progress without stopping the learning process while others are still trying to master the existing material.

Keywords: digital twins, robotics, training.

METROLOGY CHALLENGES IN IMPLEMENTING DIGITAL CALIBRATION CERTIFICATES FOR INTERNET OF THINGS MEASUREMENT (IOTM) DEVICES

dr. Laimonas Kairiūkštis

*Kauno kolegija Higher Education Institution, UAB Verslo Aljansas, Lithuania
laimonas.kairiukstis@go.kauko.lt*

Abstract

Relevance of the presentation topic: The use of IoT measurement devices in the industry is constantly growing and causing metrological problems due to various reasons such as device aging, loss of power supply, change in environmental parameters and others. To ensure the quality of the products and avoid losses in production, the devices that measure the technological parameters must be calibrated in the corresponding period and their suitability for measurement is constantly checked. In industry, due to a large number of IoTM devices, it is practically impossible to calibrate them in laboratories, so calibration must be performed onsite. Calibration ensures a continuous link between the measuring instrument and the units of the SI system. The use of paper calibration certificates when there are a large number of measuring devices greatly complicates the work of technical supervisors and is difficult to automate. Using digital calibration certificates in IoTM devices poses not only metrological problems, but also requires ensuring the security of IT systems and the uninterrupted operation of the information transmission network in the presence of limited power sources, especially when the battery life of the IoTM device must reach 5-10 years.

Methodology: Literature review of IoTM metrology problems.

Results: Proposed tools and methods for solving IoTM device calibration tasks, indicated possible obstacles in the implementation of digital calibration certificates. Different calibration methods for IoTM devices are provided, allowing the customer to choose the most optimal one to ensure the quality of the measurements and solid evidence to the client about Big Data quality assurance while performing measurements by using IoTM devices.

Conclusions & practical implications: During this applied research we focus on how to find the right solution for IoTM devices calibration while using it at Industry 4.0 plant. Regardless of the field of application of IoTM devices, digital calibration methods can be implemented in mass low-cost IoT systems, for example, in measuring devices for solid particles in the air to ensure higher resolution. In IOT metrology, the implementation of digital calibration certificates is inevitable but requires additional applied research in real systems to ascertain the environmental impact on IoTM device clusters.

Keywords: IoT, metrology, calibration.

DETERMINING THE PROPORTION OF INNOVATIVE METAL TRUSSES IN THE RATIONAL DESIGN OF SUSTAINABLE STRUCTURES

dr. Jūratė Mockienė, dr. Aras Kantautas

*Kaunas University of Applied Engineering Sciences, Lithuania
jurate.mockiene@edu.ktk.lt, aras.kantautas@edu.ktk.lt*

Abstract

Relevance of the presentation topic: Sustainable construction is a process where construction-related activities meet both the requirements of the conventional construction process and environmental protection. Climate change is an indisputable and scientifically proven phenomenon associated with the emission of CO₂ into the environment. It has been determined that construction, which includes not only the construction process itself, but also the operation of buildings and the production of building materials, emits about 40 % of the total amount of carbon dioxide. Sustainable or passive buildings would reduce the extent of CO₂ emissions. Basically, most of the criteria defining sustainable construction are focused on the rational use of costs and their reduction. The rational proportions of metal trusses covering medium and large openings with them are provided based on the designer experience of the last century. At the turn of the 20th and 21st centuries, new materials with substantially improved structural and mechanical properties of metals were introduced into construction practice. Accordingly, new and more efficient structural schemes of trusses have also emerged. Thus, it is appropriate to re-evaluate the rational proportions of innovative trusses taking the requirements of sustainable construction into account. The purpose of this work was to investigate the impact of the geometric proportions, cross-sectional shapes of the bars, and the selection of the mesh type of the trusses for covering various openings on the mass of the trusses, the deflection of the roof/cover, the cost of anti-corrosion coatings and other technical and economic indicators of the construction efficiency.

Methodology: Construction limit state methods were employed to determine the functional dependencies: truss height - its mass, truss height - structure deflection, opening - rational height of the truss, mass of the truss per unit of overlapping area - opening, the difference in metal consumption in case of cross sections of rods of different shapes - height of the structure.

Results: After examining various structural schemes of equal-span trusses, it can be confirmed that a truss made of box profiles is about 50 % lighter than the same truss made of angle bars, but its deflection is greater. At the same span, the ratio of truss mass and deflection depends on the structural truss scheme. The lower the mass of the truss and the greater the deflection, the smaller it is.

Conclusions & practical implications: The minimum mass per unit area to be overlapped increases uniformly as the span of the truss increases. It was found that under the conditions studied, it is best to use bars with a cross-section of a box profile for trusses. The minimum mass of these bars per unit of overlapping area is almost 1.5 times less than that of a truss of the same type and span, with bars made from angle bars.

Keywords: building, design, sustainable process, truss.

CHANGE OF THE CHARACTERISTICS OF WILD BLUEBERRY PASTILLES IN RESPONSE TO CONSUMERS' NEEDS

dr. Ingrida Kraujutienė¹, dr. Rasa Volskienė¹,
dr. Annemie Froyen², Sem Hansen²

¹Kauno kolegija Higher Education Institution, Lithuania, ²Leuven Limburg University, Belgium
ingrida.kraujutiene@go.kauko.lt, rasa.volskiene@go.kauko.lt
annemie.froyen@ucll.be, sem.hansen@ucll.be

Abstract

Relevance of the topic: Improving the biological value of foods and reducing sugar is one of the most important scientific areas of interest for both producers and consumers. In general, foods without added sugars are considered suitable for consumption by people with diabetes or as a preventive measure against diabetes. Wild blueberries are rich in flavonoids and have been used in the production of pastilles with apple puree to increase nutritional value and to provide distinctive sensory properties. The aim of this study was to evaluate the effect of wild blueberry pastilles made with and without sugar on glucose levels in type 2 diabetic and non-diabetic subjects, the sensory properties of the product, and moisture content.

Methodology: The moisture content is determined by drying the sample at 102 °C to constant weight in a Venticell oven. Capillary blood glucose tests were carried out in the morning refraining from eating breakfast and drinking water. Subjects ate 30 g of wild blueberry pastilles. Capillary blood glucose concentrations were measured using the Contour Plus system. Sensory analysis was carried out based on appearance, taste and consistency.

Results: Wild blueberry pastilles is an allergen-free product with a distinctive dark purple appearance and a blackcurrant taste. The results of the blood test showed that the instantaneous capillary blood glucose concentration in healthy subjects consuming the blueberry fruit pastilles with and without sugar changed gradually up to 1 hour and after 90 minutes returned to the level as prior consumption. Both sugar-free and sugar-sweetened wild blueberry pastilles had an adverse effect on diabetic subjects. Both products raised capillary blood glucose for up to 90 minutes after consumption. The most pronounced spikes after consumption of sugar-free wild blueberry pastilles occurred 60 minutes later and with sugar - after 15 minutes, the maximum effect of both product types was observed 90 minutes after consumption. Subsequently, glucose levels began to decline but the difference remained significant compared to baseline. The without sugar product type increased the glucose concentration by 1.14 mmol/l and with sugar by 2.03 mmol/l.

Conclusions & practical implications: These results suggest that wild blueberry pastilles do not affect capillary blood glucose levels in healthy people, but do increase it in diabetic people and should be used in moderation, limiting intake to (> 30 g) at one time. The additional use of sugar gives a sweeter taste and increases surface stickiness.

Keywords: wild blueberry pastilles, moisture content, glucose levels, sensory properties.

QUANTITATIVE ASSESSMENT OF PHYTONUTRIENTS IN BLUEBERRIES

Inga Pupelienė, Ilona Šostakienė

*Kauno kolegija Higher Education Institution, Lithuania
inga.pupeliene@go.kauko.lt, ilona.sostakiene@go.kauko.lt*

Abstract

Relevance of the presentation topic: Phytonutrients in plants play important roles in their growth and development. Polyphenols are extremely important compounds in the human diet that contribute to the promotion of human health and to the improved quality of human food items. Polyphenols have an immunomodulatory role, and their intake correlates with a decrease in incidences of chronic illnesses such as cardiovascular diseases, diabetes mellitus, and cancer, while they simultaneously protect food products by their anti-microbial and antifungal properties.

Methodology: Total phenolic content (TPC) in aqueous extracts was determined according to the Folin–Ciocalteu's procedure (Singleton et al., 1999) (deSouza et al., 2014). The extracts were mixed with Folin–Ciocalteu reagent and sodium carbonate solution. The mixture was stirred and kept at room temperature for 2 h in the dark. The absorbance was measured at 765 nm against a blank using a spectrophotometer. TPC results expressed as mg gallic acid equivalents (GAE)/100g fresh weight (mg GAE/100 g).

Results: In blueberry, the most phenolic compounds were found in ethanolic extracts, compared to water extracts. When analyzing the aqueous extracts, the most phytonutrients were found in frozen berries, but the studies are not precise and cannot be compared with each other, because the berries were not taken from the same batch. Ethanol extracts are also higher in frozen berries. This may be related to the different growing and ripening conditions of the berries. Billberries contain more phenolic compounds than blueberries. Higher amounts of these compounds were found in aqueous extracts and more in fresh berries than in frozen ones.

Conclusions & practical implications: The most phenolic compounds were found in ethanolic extracts, compared to water extracts in blueberry. The most phytonutrients were found in frozen berries. Ethanol extracts are also higher in frozen berries. Billberries contain more phenolic compounds than blueberries.

Keywords: blueberry, phytonutrient, phenolic compounds, berries.

EFFECT OF LED LAMP ON CUCUMBER YIELD AND THEIR QUALITY

Donatas Klimavičius

*Kauno kolegija Higher Education Institution, Lithuania
donatas.klimavicius@go.kauko.lt*

Abstract

Relevance of the presentation topic: In the laboratory of the practical training center of the Faculty of Technology of Kaunas College, the Department of Food and Agrotechnology, the effect of LED lights on cucumber varieties was studied. 'Wisconsin SMR 58' for seedling quality, plant growth, fruit set and fruit quality. The aim of the study was to find out the influence of additional lighting on the quality and yield of cucumber seedlings and their fruits.

Methodology: Research conducted in 2022 in the agrotechnology laboratory of the Department of Food and Agrotechnology of the Faculty of Technology of Kaunas College, the dependence of the cucumber (*Cucumis sativus L.*) hybrid 'Wisconsin SMR58' on their seedling growth, germination, and fruiting was investigated using the quality of LED type light. The variety is early, matures 58 days after sowing, resistant to diseases and adverse weather conditions, can be used outdoors when sowing in beds or planting seedlings. The plants were grown in polymer pots of 10 l capacity filled with acidified peat substrate and supplemented with long-acting fertilizer NPK 14-16-18, 1.2 kg/m³. Light emitted by semiconductor lamps with a photon flux density of 250 $\mu\text{mol m}^{-2} \text{s}^{-1}$ was used for growing seedlings and plants together with outdoor light during the day. The use time regulator is switched on for a period of 14 hours. When evaluating the quality and productivity of cucumbers and plants, 7 repetitions were applied, the plants were evaluated in the period from May 2. until June 11 During plant growth, moisture content is measured and they are watered as needed. The quality of sprouts is fixed, the fruits are weighed and evaluated. Hypocotyl height (cm) and diameter (cm) were measured. Plant height (cm), number of leaves (pcs), leaf area (cm²). In the assessment of qualitative indicators, conformity to the class was fixed, the number of fruits per plant (unit), fruit weight (g), the typicality of varieties characterized by the shape was visually assessed, the amount of soluble dry matter (percent) measured with a refractometer PAL-1, the amount of nitrates NO₃-N (ppm) in fruits was measured using an electronic meter B-343 by the ion-electron method. Changes in the index of chlorophyll content in leaves were measured with a digital measuring device CM1000. The research was carried out using the methodology "Application of quality requirements to fresh fruits and vegetables" developed in 2003 by the Institute of Horticulture and Horticulture, branch of LAMMC.

Results: The results of the study allow us to state that the quality of cucumber seedlings, the duration of ripening, the quantity of fruits and their quality directly depend on the variation in the photosynthesis index and the intensity of other biological factors. When assessing the compliance of the quality of cucumber seedlings with the standard, it was found that all plants grown using Hortiled lamps met the requirements stipulated in the standard. Using Hortiled lamp lighting for ripening cucumbers, it was found that the lighting had a direct effect on the flowering intensity of the plants and the abundance of fruiting at the beginning of fruiting on May 1-15. In the subsequent period from May 15 to June 11, lighting had no regular effect on cucumber yield. The weight of the fruits was determined to be slightly higher than typical for the variety, which was due to the better lighting of Hortiled and the amount of fruits per plant. The color of the fruit corresponded to the

characteristic characteristics of the variety. Nitrate NO₃ N(ppm) was found to be low and ranged from 32 to 42.

Conclusions & practical implications: The research data states that the fruit characteristics of the variety meet the standards specific to the variety. The weight of the fruits was determined to be slightly higher than usual, which was due to the better lighting of Hotiled and the amount of fruits per plant. The color of the fruit corresponded to the characteristic characteristics of the variety. the results of the study showed that it is useful to grow cucumbers using LED lamps.

Keywords: variety, photosynthesis, standard.

ANALYSIS OF GRAIN STORAGE TECHNOLOGIES IN THE ELEVATORS OF AGROKONCERNO GRŪDAI, UAB

Irena Tulabienė

Kauno kolegija Higher Education Institution, Lithuania
irena.tulabiene@go.kauko.lt

Abstract

Relevance of the presentation topic: Rapid climate change threatens many plant species with the spread of invasive diseases and pest species. Weaker plants produce a lower-quality harvest and some pathogens or pests may be transported with the produce to storage areas.

Methodology: The sampling of the grain from the vehicle must be carried out in accordance with the requirements of LST EN ISO 24333 (2016). For the laboratory examination of the quality of the grain, a sample of at least 2 kg has been taken for the identification of microscopic fungi and pests.

Results: The research was carried out from 2020 to 2022 in two elevators (X1, X2) located in three different regions in Lithuania. Samples were taken from *Triticum aestivum* L. and *Vicia faba* L., sampled for the presence of the following pests: *Sitophilus granarius* L., *Tribolium confusum* Jacquelin, du Val, *Acanthoscelides obtectus* Say, *Acarus siro* L. and the presence of the microscopic fungi: *Fusarium* spp. L., *Claviceps purpurea* (Fr.) Tul. and *Tilletia caries* (DC.) Tul. & C. Tul. The most abundant fungi in the samples has been bean weevil and *Fusarium* spp. In the samples from Elevator X1, *Acanthoscelides obtectus*, Say dominated and it was found in all the years of the survey, especially in 2022: 29 units of this pest were found in a 300 g sample. The granary weevil was most abundant in 2021, while the flour mite was not detected throughout a three-year study. Microscopic fungi spread more in wetter years. Grain is accepted for storage in the elevator if less than 1 % of fusarium-damaged grain (FDK) is identified in a 50 g sample. The highest incidence of microscopic fungi was in 2021 at 1.2 %. Between 2020 and 2022, the intensity (FDK severity) of microscopic fungi (*Fusarium* sp.) in stored wheat (*Fusarium* sp.) in elevator X2 was 0.5% in 2020, with the lowest intensity recorded in 2022. *Claviceps purpurea* and *Tilletia tritici* have not been found in grain stored at X2 elevator from 2020 to 2022.

Conclusions & practical implications: Grain sampling and quality determination are carried out in accordance with LST standards. The quality class is assigned on the basis of the quality parameters determined. In the case of the tests above the standard for contamination with pests and microscopic fungi, sedimentations are applied.

Keywords: grain hopper, elevator, pests, microscopic fungi.

FARMERS' ENVIRONMENTAL SUSTAINABILITY BEHAVIOUR

dr. Jurgita Zaleckienė¹, Renatas Puška²

¹Kauno kolegija Higher Education Institution,

²Vytautas Magnus University Agriculture Academy, Lithuania

jurgita.zaleckiene@go.kauko.lt

Abstract

Relevance of the presentation topic: The European Green Deal is a set of policy initiatives aimed at a green transformation of the EU, with the goal of climate neutrality by 2050. The policy package takes a holistic approach and includes initiatives in the areas of climate, environment, energy, transport, industry, agriculture and sustainable finance. For agriculture, there are separate initiatives such as the EU's "Farm to Fork" Strategy, the EU Biodiversity 2030 Strategy, the Soil Strategy, the Organic Farming Action Plan, etc. However, policy tools are worthless if they are not properly implemented. These decisions are directly linked to good implementation practices. Agriculture receives particular attention because, above all, it is a resource-intensive sector, which has a significant and often negative impact on the natural environment. Secondly, agriculture provides food for the human population. Farmers, as the first link in the agri-food value chain, have a key role to play in ensuring that these measures are properly implemented. The aim of this study is to assess farmers' attitudes towards sustainable production.

Methodology: The methods used to identify the indicators under study were scientific literature, document analysis and synthesis. For the empirical study, analysis of secondary sources of information and documents. Farmers' involvement in sustainable production was assessed by analysing statistical information on the number of organic farms and the number of farms implementing short food supply chain solutions. The study region is Lithuania. Statistical information covers the period 2020-2022.

Results: The study shows that policy initiatives and measures encourage farmers to transform their farm activities and production technologies. The number of certified organic farms in Lithuania is not very large and is growing rapidly, but the area under certified organic production is consistently increasing. In 2023, it was 243 000 ha and the number of certified farms has decreased by 9%. This shows that organic farms are becoming larger, which allows for more efficient production. Short supply chains are gaining popularity, but there are not many farmers who sell their produce directly. In 2019, the State Food and Veterinary Office issued 486 permits to producers of small quantities of animal food products, with a 22% increase by 2023.

Conclusions & practical implications: Based on the results of the scientific literature and the empirical study, it can be said that sustainable solutions are being implemented on farmers' farms. Deployment is linked to the achievement of economic objectives. However, the pursuit of economic objectives also enables the implementation of social and environmental objectives. Further research could focus on identifying the factors limiting the implementation of sustainable solutions and on providing measures to mitigate their impact.

Keywords: farmers' behaviour, sustainable agriculture, sustainable development.

DETERMINATION OF THE AREA INDEX OF LETTUCE LEAVES WITH MONOCULAR CAMERA

dr. Laimonas Kairiūkštis¹, Başak Yalçiner², Emre Özkul²

¹Utena University of Applied Sciences, Lithuania, ²KTO Karatay University, Turkey
kairiukstis.laimonas@gmail.com, bskylcnr.97@hotmail.com

Abstract

Relevance of the presentation topic: The conducted experiments demonstrate the successful integration of a monocular camera into a smart hydroponic agriculture system for lettuce harvest time determination.

Methodology: The literature review of various hydroponics systems was performed. The quantitative research was based on the analysis of the lettuce images at different growing periods. Lettuce photos were processed with an image recognition algorithm, then the leaf index was determined and statistical analysis was performed, which allows to identify possible growth problems and the expected time of harvest.

Results: The leaf area index serves as a fundamental metric in the analysis, aiding us in accurately measuring the size of the lettuce plants. For the size estimation approach, we used a dataset containing HSV calculated max area pixel index values of lettuce plants grown from 1 to 7 weeks. By clustering pixel values using the Gaussian Mixture Models (GMM) algorithm, we identified the cluster representing 1-week-old lettuce plants with the lowest pixel values, while the cluster representing 7-week-old lettuce plants had the highest pixel values. This process was repeated every week, resulting in distinct clusters corresponding to specific weeks of lettuce growth.

Conclusions & practical implications: By associating the detected lettuce plants with their respective clusters, we could infer the growth period and readiness for harvesting for each plant. This method offers valuable insights into monitoring lettuce growth and optimizing harvesting schedules at different stages for lettuce farmers and agricultural researchers through non-intrusive imaging techniques. This study shows the potential of computer vision and machine learning algorithms in transforming traditional agricultural practices into more efficient and data-driven processes.

Keywords: image processing, real time, hydroponics, automation, agriculture.

ENERGY-RELATED CARBON DIOXIDE EMISSIONS IN LITHUANIAN AGRICULTURE AND FORESTRY: RESULTS OF DIVISIA INDEX-BASED DECOMPOSITION ANALYSIS

dr. Daiva Makutėnienė, dr. Valdemaras Makutėnas

Kauno kolegija Higher Education Institution, Lithuania

daiva.makuteniene@go.kauko.lt, valdemaras.makutenas@go.kauko.lt

Abstract

Relevance of the presentation topic: As the economy grows, the demand for energy increases. On the other hand, as energy consumption increases, carbon dioxide (CO₂) emissions increase, which negatively affects the climate. According to scientists, the contradiction between economic growth and energy consumption is becoming more acute. This is typical for the economies of individual countries as a whole and for individual sectors. One of the causes of climate change is carbon dioxide entering the environment due to the intensive use of energy in agriculture and forestry. Recently, with the world paying special attention to climate neutrality, it is important to analyse not only the dynamics of greenhouse gases emissions emitted during crop and livestock production but also to assess the intensity of energy consumption in agriculture and forestry, as well as carbon dioxide emissions related to energy consumption and the possibilities of reducing it.

Methodology: The methodology is based on methods of decomposition analysis, the logarithmic mean Divisia index, interpretation and relevant comparisons of selected indicators. The data cover years 1995–2021. Statistical data of Eurostat was used.

Results: The additive and multiplicative decomposition analysis of the logarithmic mean Divisia index showed that due to the effects of the studied factors (general economic activity, energy intensity, CO₂ emission intensity effects), both energy consumption and carbon dioxide emissions related to energy consumption varied unevenly in Lithuanian agriculture and forestry. During the period under review, due to the overall economic activity effect, energy consumption and energy-related carbon dioxide emissions increased by 8.4 percent in the sector, while the energy intensity effect decreased energy consumption by 3.4 percent. Due to the carbon intensity effect, carbon dioxide emissions related to energy consumption in the country's agriculture and forestry decreased by 3.6 percent in the considered period.

Conclusions & practical implications: Energy consumption in Lithuanian agriculture and forestry from 1998–2021 markedly decreased. This was influenced by the modernization of energy supply, transformation, and final consumption systems, the application of more advanced technologies, and structural changes related to the country's accession to the EU. By using more and more modern machinery and production technologies, the amount of carbon dioxide emissions related to energy consumption has almost halved in the country's agriculture and forestry during the considered period. The intensity of carbon dioxide emissions related to energy consumption had a clear downward trend and decreased by an average of 7.4 percent every year.

Keywords: energy consumption, energy-related carbon dioxide emissions, agriculture and forestry, the logarithmic mean Divisia index, decomposition analysis.

NATIONAL STRATEGY AND MEASURES IN THE FIELD OF BROADBAND DEVELOPMENT

Albertas Turonis

*Ministry of Transport and Communications of the Republic of Lithuania, Lithuania
albertas.turonis@sumin.lt*

Abstract

Relevance of the presentation topic: The presentation provides information on the Government's strategy, goals and measures to ensure rapid broadband development in Lithuania. It outlines the key legislative and financial initiatives that public authorities are implementing and plans to implement new generation networks and services available to all citizens. The broadband strategy of the Lithuanian state is in line with EU goals. Until 2025 5G connection must be installed in the territories of all the largest cities, all households must be guaranteed 100 Mb/s internet speed, and by 2030 all households would be connected to gigabit internet in all populated areas and 5G internet would also be available. 5G communication should work in major cities, international transport corridors, railway lines, airports, and seaports. To ensure the implementation of these goals, the EMF regulation, the STR regulations regarding the installation of antennas on state or municipal buildings, and the designed broadband network infrastructure on the Rail Baltica and Via Baltica highways must be updated. It must be possible to install public networks on roads and to promote the development of innovative mobile communication services and Internet of Things solutions, to coordinate cooperation between municipalities and communication operators for faster development of 5G communication. On 12 October 2021, a memorandum was signed on the implementation of 5G communication in Lithuania. The memorandum was signed by the Ministry of Communications of the Republic of Lithuania, the Communications Regulatory Authority of the Republic of Lithuania, AB Telia Lietuva, AB Bitė Lietuva, AB Tele2, PE Plačiajuostis internetas, UAB Lietuvos automobilių kelių direkcija, AB LTG Infra, the Association of Lithuanian Municipalities and Lithuanian municipalities and end providers of 5G communication services. For that purpose, LRV in 2023 June 21 No. 471 adopted the resolution "Regarding the recognition of the project of 5G mobile communication development in the Republic of Lithuania as a project of national importance". It is intended to draw up a special plan for the development of electronic communications infrastructure throughout the territory of the Republic of Lithuania. For the promotion of innovation, it is planned to create a test infrastructure "SandBox", which simultaneously includes the financial, legal and regulatory environment. The networks are intended to use only equipment from reliable manufacturers and suppliers whose manufacturer does not belong to the European Union, NATO, the European Free Trade Association and/or the Organization for Economic Cooperation and Development. In LT, a high-speed broadband development plan for 2021-2027 has been drawn up, the responsible executor of which is Public Company Plačiajuostis internetas.

Methodology: The application of EU normative documents to the Republic of Lithuania

Results: Expanding the 5G network and ensuring gigabit speeds for all households.

Conclusions & practical implications: Implementation of the envisaged measures within the foreseen scope and timeframe.

Keywords: 5G, broadband, fixed networks, mobile networks, strategy.

EU REGULATORY MEASURES TO ENSURE OPEN INTERNET ACCESS AND TO ACHIEVE GIGABIT SOCIETY OBJECTIVES

dr. Virginijus Stundžia

*The Communications Regulatory Authority of the Republic of Lithuania (CRA), Lithuania
virgilijus.stundzia@rrt.lt*

Abstract

Relevance of the presentation topic: Open gigabit internet regulatory measures discussed in European Commission report "On the implementation of the open internet access provisions of Regulation (EU)", COM(2023) 233 Final, 28.4.2023, Brussels. The Regulation includes end-users the directly applicable right to access and distribute lawful content and services of their choice via their internet access service; the principle of net neutrality. The end-users' rights cannot be limited by the agreements between internet providers and traffic management practices. The Regulation provides for the end-user's right to access and distribute information and content, to use and provide applications and services, and to use terminal equipment of their choice. The study shows that authorised blocking is widely used, in particular under two exemptions: (a) legislation and (b) security and integrity.

Gigabit Infrastructure Act "On measures to reduce the cost of deploying gigabit electronic communications networks and repealing Directive 2014/61/EU" is part of the regulatory framework for electronic communications and is consistent with the other legislative and non-legislative instruments. The current patchwork of rules creates barriers to cross-border investment. This limits the freedom to provide electronic communications networks and services. Significant progress has been made on the access to existing physical infrastructure and the related transparency measures, while there has been less progress on granting permits, coordination of civil works and access to in-building infrastructure. In the absence of a justified exception, physical infrastructure elements owned or controlled by public sector bodies, even when they are not part of a network, can also host electronic communications network elements and should be made accessible to facilitate installing network elements of very high-capacity networks, in particular wireless networks. This Regulation aims to facilitate and stimulate the roll-out of very high-capacity networks by promoting the joint use of existing physical infrastructure and by enabling a more efficient deployment of new physical infrastructure so that such networks can be rolled out faster and at a lower cost.

Methodology: Application of EU regulatory documents to the Republic of Lithuania.

Results: Assessment of the current situation and proposals for the creation of a gigabit society.

Conclusions & practical implications: Creation of an open Internet environment in Lithuania.

Keywords: broadband, internet infrastructure, gigabit society objectives.

PUBLIC INSTITUTION PLAČIAJUOSTIS INTERNETAS. BROADBAND DEVELOPMENT PROJECTS IN COMMERCIALY UNATTRACTIVE RURAL AND REMOTE AREAS OF LITHUANIA

Gytis Liaugminas, Eglė Misienė, Donatas Bernatonis, Jolanta Kavaliūnaite

PE Plačiajuostis internetas, Lithuania

*g.liaugminas@placiajuostis.lt, e.misiene@placiajuostis.lt,
d.bernatonis@placiajuostis.lt, j.kavaliunaite@placiajuostis.lt*

Abstract

Relevance of the presentation topic: The Public institution Plačiajuostis internetas is a non-profit organization under the Ministry of Transport and Communications of the Republic of Lithuania. Company was established in 2005 to meet two main goals: to create a modern, future-oriented infrastructure of electronic communications and to provide high quality wholesale broadband services. Public institution Plačiajuostis internetas has already implemented five broadband development projects in commercially unattractive rural and remote areas of Lithuania: "Rural Area Information Technology Broadband Network RAIN" (RAIN), "The Development of Rural Area Information Technology Broadband Network RAIN" (RAIN2), "Broadband infrastructure development in rural areas" (PRIP), Support for broadband infrastructure (stage II) (PRIP2) and "Development of Next Generation Access Infrastructure" (NKP/RAIN3). The fiber optic network created during these projects consists of about 11,252 kilometers of fiber optic cable lines, 25 communication towers, 5,832 active devices and 35,095 passive network elements. The network currently provides more than 5,800 wholesale communication services to operators in more than 1,950 settlements. Projects "The Development of Rural Area Information Technology Broadband Network RAIN" (RAIN2) and Support for broadband infrastructure (stage II) (PRIP2) are awarded at the European Broadband Awards.

Methodology: Broadband development by deploying fiber optic networks and building telecommunications towers

Results: The fiber optic network created during these projects consists of about 11,252 kilometers of fiber optic cable lines, 25 communication towers, 5,832 active devices and 35,095 passive network elements. The network currently provides more than 5,800 wholesale communication services to operators in more than 1,950 settlements.

Conclusions & practical implications: For more information www.placiajuostis.lt, <https://youtu.be/4eR7ZIC72io>

Keywords: broadband, broadband awards, plačiajuostis internetas, rural and remote areas, socio-economic drivers, wholesale telecommunication services, Lithuania.

PASSIVE OPTICAL CABLES: THE PRESENT AND THE FUTURE

Vilmantas Vasiliauskas

Telia, Lithuania

vilmantas.vasiliauskas@telia.lt

Abstract

Relevance of the presentation topic: The need for new-generation high-broadband fixed services. We are currently undergoing generation change as GPON has been serving customers for more than 10 years.

Methodology: Telecommunication networks knowledge based on the largest Lithuanian fixed services operator experience. New generation (XGS-PON) improvements, differences, potential use cases and challenges to convert existing networks to modern ones have been analyzed in this paper.

Results: Brown field alternatives for XGS-PON implementation on existing GPON network.

Conclusions & practical implications: GPON has been a long-standing leader for providing most efficient, top-quality services for B2C and B2B customers. New generation (XGS-PON) high-broadband fixed optical cables are suggested for the future.

Keywords: PON, OLT, ONT, GPON, XGS-PON.

IT SECTOR BUSINESS DEVELOPMENT IN REGIONS: PROS AND CONS

Linus Prušinskas

UAB Besmegeniai, Lithuania

linas@besmegeniai.lt

Abstract

Relevance of the presentation topic: The research of the presentation fills a practical gap: the business environment regulation by local authorities; competitive environment (local companies and major competitors); workforce and other resources for business development in the region; what are the associations and what is the benefit for regional business to be a member.

Methodology: Practical experience in developing IT business in the region for more than 23 years.

Results: Local authorities' requirements need to be harmonized and more common; competition is limited by big business budgets, confidence in their size, difficulties in developing new networks; qualified labor shortage in the region, the issue of wages; associations unite operators of IT sector, represent and protect their legal, economic, commercial and other interests in various state and business institutions.

Conclusions & practical implications: With the increasing demand for the Internet as a service and its differentiation, more and more businesses will find their niches in this market

Keywords: associations, competition, BESMEGENIAI, development, IT, local authorities, region.

METHOD OF CALCULATING OF PASSIVE OPTICAL TRUNK SIGNAL LEVELS

dr. Rimantas Plėštys, dr. Jurgita Dabulytė-Bagdonavičienė, Gintaras Butkus

Kauno kolegija Higher Education Institution, Lithuania

rimantas.plestys@go.kauko.lt, jurgita.dabulyte@go.kauko.lt, gintaras.butkus@go.kauko.lt

Abstract

Relevance of the presentation topic: The currently applied direct method of connecting remote internet users with optical lines does not provide an opportunity to connect users located near these optical lines. It is suggested to connect such users to optical lines using optical splitters. The article presents the method of the placement of optical splitters and the calculation of their technical parameters.

Methodology: Mathematical calculations.

Results: The passive optical trunk application in optical access networks was analyzed and methodology for calculating the parameters of optical splitters was developed.

Conclusions & practical implications: The conducted research allows us to calculate the possible number of internet users connected to the optical trunk and their possible distance from the beginning of the trunk.

Keywords: ODN, FTTH, G-PON.

ANALYSIS OF ENERGY EFFICIENCY OF OPTICAL DATA TRANSMISSION TECHNOLOGIES

dr. Rimantas Plėštys, dr. Vidmantas Rimavičius

Kauno kolegija Higher Education Institution, Lithuania
rimantas.plestys@go.kauko.lt, vidmantas.rimavicius@go.kauko.lt

Abstract

Relevance of the presentation topic: Rural users are usually connected to the Internet through mobile base stations, which consume hundreds of watts of electricity. Connecting base stations to the Internet by laying optical cables along reserving tracks and building power lines requires a lot of additional energy resources. In the case where the density of users is low, the amount of energy used per user is very high. Energy resources for connecting users to the Internet using optical data transmission technologies are comparatively low. From the energy point of view, the selection of the most suitable optical technologies for each specific case is a current task.

Methodology: Mathematical calculations, comparative analysis.

Results: The energy efficiency of different data optical transmission technologies and the network formed by them was calculated, evaluating the electricity consumption per information bit.

Conclusions & practical implications: It has been established that in rural areas, the best energy efficiency results are obtained by using optical trunks with installed optical splitters.

Keywords: FTTH, passive optical networks, G-PON, XGS-PON.

Order No. I-2495.

Published by Advertising and Media Centre of Kauno kolegija Higher Education Institution,
Pramonės pr. 20, LT-50468 Kaunas